



## Formulating a Business Management Strategy for E-shopping Websites Using Management Analysis

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### Abstract

With the rapid development of the Internet, e-shopping websites have sprung up at an increasing rate. E-commerce has thus become an important research issue. Because of the low barriers to entrance and minimal capital investment, many people have begun to run their own websites in the online shopping market. However, it is challenging to differentiate such websites to gain a competitive advantage. Prior studies in Taiwan have paid much more attention to websites' structure, customer relationship management, and privacy issues, but lack focus on business strategies. This research is an attempt to understand the key factors of e-shopping websites' success, by adopting the ICDT (Information, Communication, Transaction, and Distribution) model as a classification framework. Subsequently, we also use the fuzzy analytic hierarchy process (FAHP) and the interpretive structural model to identify the key operational factors and convert these factors into the core problems according to the TRIZ theory. Therefore, this research provides operating strategies for e-shopping websites, which can guide future entrants.

*Keywords: e-shopping website; ICDT model; fuzzy analytic hierarchy process; interpretive structural modeling; TRIZ theory*

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## 以管理工具擬定購物網站之經營管理策略

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### 摘要

隨著網際網路的蓬勃發展，台灣電子商務網站如雨後春筍般冒出，電子商務也成為一個相當重要的研究議題之一。電子商務進入障礙低，資本額小，因此有許多人紛紛投入電子商務市場，但要如何做到差異化，或具有經爭優勢，則是一大挑戰。過去探討有關台灣電子商務網站的研究多注重在網站架構、顧客關係管理、網路信任與隱私等問題，而較少著墨在經營策略等議題上，故本研究為了解購物網站經營的關鍵成功因素，因此應用 ICDT 模式（The Information, Communication, Transaction, and Distribution model）來做為分類架構，並且使用模糊層級分析與詮釋結構模式，找出經營購物網站之關鍵因素，並且以此作為轉換成 TRIZ 理論核心問題的依據，進而擬定經營購物網站之策略，藉此作為業者未來經營的參考方向。

關鍵詞：購物網站、ICDT 模式、模糊層級分析、詮釋結構模式、TRIZ 理論

### 1. Introduction

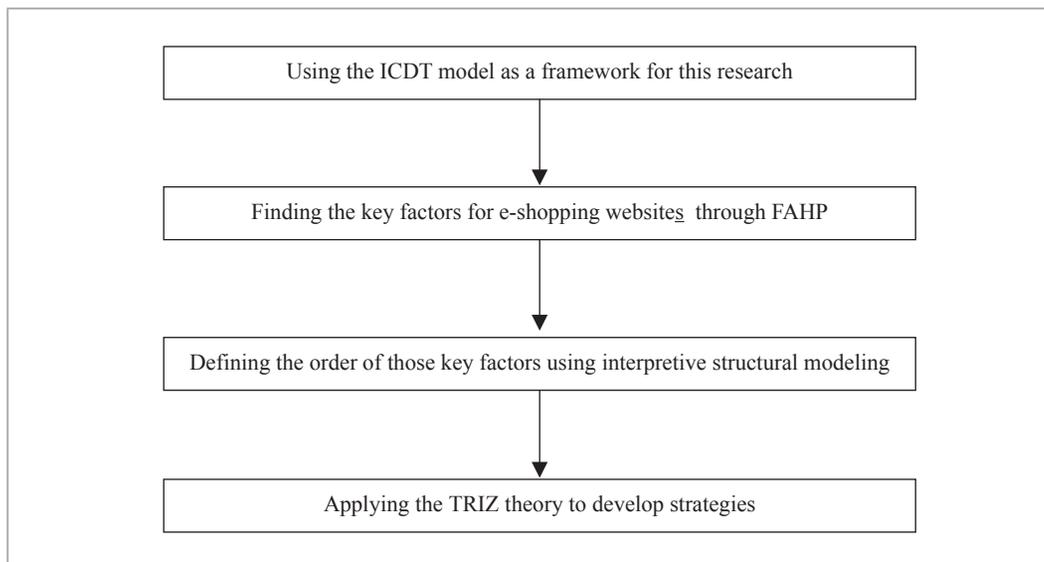
Due to the low threshold and low cost (Chen, 2010; Wu and Shih, 2012) of e-shopping websites, it is not difficult for competitors to enter into this market. However, there are only a few popular and successful e-shopping websites in the Taiwanese market, and their business operations are not easy to describe. One reason is that managers have no suitable strategy for running their e-shopping websites; another is that they are tied up by the operational activities for running their websites. Working in both virtual and tangible channels might pressure the operation managers in such companies.

When assessing the prior research in Taiwan, most of the papers have focused on network architecture (Wang, 2011; Liao, 2012), website content (Chen and Chen, 2010), customer relationship management (Wang et al., 2011; Chu et al., 2012), and perceived risk (Wu et al., 2012; Yu, 2012), but lack business strategies regarding how to operate an e-shopping website.

In order to help companies to develop a set of rules for running e-shopping website,



this study applies the ICDT (Information, Communication, Transaction, and Distribution) model proposed by Angehrn (1997) to define the framework of this study and uses the fuzzy analytic hierarchy process (FAHP) method to determine the key factors for business operations. In addition, interpretive structural modeling is also used to determine the hierarchical order of factors and applies the TRIZ(Teoriya Resheniya Izobreatatelskikh Zadatch(in Russian) or Theory of Inventive Problem Solving(in English) (Rantanen and Domb, 2002) theory to formulate strategies of e-commerce websites. The main purpose of this study is to provide strategic suggestions from Taiwan business manager viewpoint for companies that want to operate Chinese e-shopping websites more efficiently in Taiwan. Below is the research process used in this study, which can provide a clear framework.



▲ Figure 1 Research framework

## 2. Literature review

In this section, we review related research in five areas: the ICDT theory, operational factors for e-shopping websites, the fuzzy analytic hierarchy process (FAHP), interpretive structural modeling, and the TRIZ theory.

### 2.1 ICDT model

The ICDT model was first developed by Angehrn in 1997 and can be followed by



companies to construct their tactics while developing virtual internet strategies. In the case of e-shopping websites' operations, the interactions between companies and customers need to consider the following: first, companies need to deliver information through their websites about their services and products to make customers aware of their availability. This is called virtual information and is represented as the "I" in the ICDT model. Second, when customers have any questions, they can interact with each other through the channels provided by e-shopping website companies. This is called virtual communication space and is represented by the letter "C" in the ICDT model. Then, the letter "D" in ICDT stands for virtual distribution space, which means that after a customer places his or her order, a company will deliver the service or product to the customer. This means that customers can recommend such websites to others after they have experienced shopping on them. Finally, the letter "T" of the ICDT model stands for virtual transaction space, and it means that while customers are interested in the services or products of e-shopping websites, they are also willing to actually purchase from them. Therefore, these four letters in the ICDT model can interpret the process of interaction between e-shopping websites and customers, and it is suitable for this research.

## **2.2 Factors related to the success of e-shopping website businesses**

In prior e-shopping website studies (Kwak et al., 2002; Blake et al., 2003; Chang et al., 2005; Liaw et al., 2005; Ding, 2007; Hausman and Siekpe, 2009), researchers usually examined the customers' perspective, but rarely the managers' point of view. However, the point of view of an e-shopping website is different from that of its customers and the physical company. Therefore, this study contributes by discussing the factors of e-shopping website business according to the perspective of operation managers. The factors for e-shopping website businesses applied in our survey were gathered by referring to previous studies and the method of factor translation. The ICDT theory (Angehrn 1997) is our framework. Table 1 shows the chosen factors and splits the results into three levels of hierarchy. In the third level, we put the factors and the factor identification mentioned in previous studies. In the second level, we grouped the factors with similar identifications, and finally, in the first level, we included the factors from the same virtual space.



Table 1 Study factors, questionnaire items, and references

First level	Second level	Third level	Identification of the factors in the third level	References
Virtual information space	Website interface (LI1)	Website design (XI1)	The website design includes a search function that allows customers to easily search for products, various media embedded in the site, etc.	[1], [2], [3], [4], [6], [7], [8]
		Information content (XI2)	The website provides customers with sufficient, understandable, and useful information.	[1], [2], [6], [9], [10]
		Tangibles (XI3)	The website provides customers with tangible impressions, e.g., the system interface of the website and tangible facilities.	[9], [11], [12], [13], [14], [15]
		Aesthetics of the website (XI4)	Whether the customers are willing to buy on the website again depends on their visual acceptance of the website, e.g., the pictures of products on the site are appealing to customers.	[8], [16], [17], [18], [19], [20], [21]
		Perceived ease of use (XI5)	Since it is easy for customers to use the website's system, customers are willing to purchase through the website more often.	[22], [23], [24], [25]
		Price of products and purchasing frequency (XI6)	In order to appeal to customers, the website classifies products by item price (e.g., cell phone and phone battery) and purchase frequency (e.g., digital products and daily products).	[26], [27]
	Product characteristic (LI2)	Tangible and intangible products (XI7)	In order to appeal to customers, the website classifies products by their tangibility (e.g., flowers) or intangibility (e.g., consulting services).	[8], [26]
		Different product specifications (XI8)	In order to appeal to customers, the website classifies products by their characteristics, e.g., consulting services need more related customization, while books require more detailed descriptions.	[8], [26]
	Trustworthiness (LI3)	Well-known brand (XI9)	In order to appeal to customers, the website includes famous brand products (e.g., Levis).	[8], [21], [28], [29], [30], [31]
		Endorsements (XI10)	The website is supported by powerful or famous spokesmen and women to attract more customers.	[21], [29], [30]



Virtual information space	Trustworthiness (LI3)	Free sample (XI11)	The website provides samples or experience activities.	[21], [28], [29]
		Promotion/ discount(XI12)	The website provides promotional or discount activities.	[31]
	Clauses and announcements (LI4)	Privacy measures (XI13)	Customers' privacy is respected and the way the website uses the personal information is also clearly stated in its privacy policy.	[1]
		Risk information (XI14)	The information about the product's repair or the servicing is shown on the website in order to help the customer understand the purchase risk.	Interview
		Return product/ money guarantee (XI15)	The website provides a warranty for refunds or product returns.	[21], [28], [29], [31]
		Institution-based trust (XI16)	Concerning the trade safety, the website offers a high level of safety and security through warranties, legal rights to resources, contracts, privacy policies, etc.	[24], [32], [33], [34], [35]
Virtual communication space	Passive communication(CL1)	Financial risk (XC1)	The risk of the products and services on the site not being worth its value or being accompanied with high maintain cost .	
		Performance risk (XC2)	The risk that the performance of the products and services on the site is not consistent with what customers anticipate.	
		Physical risk (XC3)	The risk that the products and services on the site might be harmful to customers.	[21], [28], [36], [37], [38]
		Psychological risk (XC4)	The risk that the style of the products and services might be not suitable for customers' self-image.	
		Social risk (XC5)	The risk that other people may not agree with customers after purchasing products or services from the website.	
		Connection time risk (XC6)	The risk that because of the inefficient website capacity, customers spend too much time connecting internet	Interview



Virtual communication space	Active communication (CL2)	Reliability (XC7)	Website managers' dependability with customers.	
		Empathy (XC8)	Website managers provide feelings of concern and care for customers.	[3], [9], [11], [12], [13], [14], [15], [39], [40], [41], [42]
		Responsiveness (XC9)	The willingness of the website managers to assist customers.	
		Expert knowledge (XC10)	The degree to which customers can rely on the professional knowledge provided by website managers.	
		Customer service (XC11)	The website provides a phone line for customer service.	Interview
	Semi-active communication (CL3)	E-shopping experience (XC12)	The reason affecting if the customers purchase on the website is the purchasing experience.	[16], [17], [18], [19], [8], [20], [21]
		Calculation-based trust (XC13)	Customers rationally measure the benefits and costs before purchasing on the website.	[32], [33],[34],[35], [24]
		Internet experience (XC14)	The extent to which customers use the Internet.	[18], [19], [20], [37], [16]
		Computer literacy (XC15)	Customers have user experience/ knowledge about computers.	
		Distribution time risk (XD1)	The risk of customers having to wait for a delivery.	Interview
Virtual distribution space	Product distribution channel (LD1)	Innovation (XD2)	Customers who purchase on the website are willing to try new products or new technologies.	[19], [44]
		Experts' recommendation (XD3)	If the website is recommended by experts, customers will be willing to increase their purchase frequency.	Interview
	Website distribution channel (LD2)	Demographics (XD4)	Customers' profiles (gender, age, job, etc.)	[18], [19], [20]
		Attitude (XD5)	Website managers should have a positive attitude toward customers.	[18], [20], [45]



Virtual transaction space	Transaction trust (LT1)	Transaction security measures (XT1)	Safety protection of website transactions, e.g., individual accounts and passwords and information data protection.	Interview
		Trust in transaction (XT2)	If the site can provide transaction safety, customers are more willing to purchase through it.	Interview
	Simple transaction (LT2)	Familiarity-based trust (XT3)	Through the experience of looking-through, transactions, and interactions, customers become more familiar with the website.	[32], [33],[34],[35], [24]
		Perceived usefulness (XT4)	If shopping on the website is useful for customers, they increase their purchasing.	[22],[23],[24], [46]

References: [1] Ranganathan and Ganapathy, 2002; [2] Liang and Lai, 2002; [3] DeLeon and McLean, 2003; [4] Wang et al., 2005; [6] Fan and Chang, 2007; [7] Hausman and Siekpe, 2009; [8] Liaw et al., 2005; [9] Liao and Chiang, 2005; [10] Haand Stoel, 2008; [11] Parasuraman et al., 1994; [12] Parasuraman et al., 2005; [13] Liao and Chiang, 2005; [14] Liang and Lee, 2006; [15] Lin et al., 2007; [16] Westbrook, 1980; [17] Butler and Peppard, 1998; [18] Kwak et al., 2002; [19] Blake et al., 2003; [20] Wang and Ho, 2006; [21] Ding, 2007; [22] Davis, 1989; [23] Davis et al., 1992; [24] Wu et al., 2008; [25] He et al., 2008; [26] Phau and Poon, 2000; [27] Vijayasathy, 2002; [28] Roselius, 1971; [29] Akaah and Korgaonlar, 1988; [30] Tan, 1999; [31] Poel and Leun, 1999; [32] Gefen, 2000; [33] McKnight et al., 2000; [34] Palmer, 2002; [35] Gefen et al., 2003; [36] Jacoby and Kaplan, 1972; [37] Liao and Cheung, 2001; [38] Lim, 2003; [39] Cronin et al., 2000; [40] Vijayasathy and Jones, 2000; [41] Yang and Jun, 2002; [42] Santos, 2003; [44] Robinson et al., 2004; [45] Childers et al., 2001; [46] He et al., 2008



### 2.3 Fuzzy Analytic Hierarchy Process (FAHP)

This study uses the fuzzy analytic hierarchy process (FAHP) as the main analytical method. The idea of FAHP is originally based on the improved analytic hierarchy process (AHP), which was first introduced by Satty in 1971 (Satty, 1980). However, due to the drawbacks of hierarchy analysis, such as the relationships between decision characteristics, uncertainty, complicated calculations, and inefficiency (Deng and Zeng, 1989; Belton and Gear, 1985; Hu 2006; Bozbura and Beskese, 2007; Durán and Aguilo, 2008), van Laarhoven and Pedrycz (1983) proposed a new method called fuzzy analytic hierarchy process (FAHP). It can help managers and decision-makers to determine the optimal decision, get reasonable and informed hypotheses/predictions, and decrease the probability of making mistakes.

This study further adopts the ordinal scale (Hu, 2006; Sheu, 2004) instead of Satty's ratio scale. The method for calculating the weights for each level in this study is shown in Table 2. As for the weight of the items, Hu (2006) studied the key factors of online shopping and defined three methods to determine the weight of a level based on different considerations. The main idea of these methods is that the effect factors in level X+1 of the first level will be influenced by the factors in level X. These three methods are partial inheritance law, complete inheritance law, and complete independent law (Table 2).

▼ Table 2 Three hypotheses on defining the weight of the whole hierarchy

Hypothesis	Consideration	Name
The weight of the factors in level X+1 is same as the weight in level X.	A child's intelligence will be partially affected by one of his/her parents.	<i>Partial inheritance law</i>
The rank of factors in level X+1 is affected by the weight of the factors in level X.	A child's intelligence is totally affected eventually by one of his/her parents.	<i>Complete inheritance law</i>
The weight of each factor in level X+1 is not affected by the weight of each factor in level X.	A child's intelligence will not be affected by one of his/her parents.	<i>Complete independent law</i>

Note: in the columns of hypothesis and consideration, the word "child" represents hierarchy X+1 and the word "parent" represents level X (Hu, 2006).

### 2.4 Interpretive structural modeling

In business operations, it is difficult for managers to make structural decisions when facing largely relative problems as well as to prioritize things when considering many parallel plans and strategies. Warfield (1976) developed an analysis method called interpretive structural modeling (ISM) to solve decision-making problems. First, there are



three major tasks to develop a system subordination matrix: (1) identify the relevant set of elements and relations using a quantification method; (2) determine which elements are subordinate to which other elements; (3) encode the subordinate relationships in matrix form. Second, according to the structure of the order, it systematically calculates the hierarchy's figure to form the hierarchy matrix. Finally, we can develop connected graphs from a connected subordinate matrix/matrices. We believe that our research results can help managers to build and implement their own plans and strategies. ISM can be applied to determine the rank of hierarchies, not only in education (Lin, 2005), but in other fields as well, such as city urban planning, industrial engineering, company planning, and company structural problems (Wang, 2007; Agarwalet al., 2007; Chang et al., 2008; Shiri et al., 2008; Ravi et al., 2005). This study uses ISM to determine the structural relationship between the factors and determines the processes and orders of business operations.

## 2.5 TRIZ theory

TRIZ theory, introduced by Russian scholar Altshuller (1999) and his research team in 1946, can help managers to deal with the problems of contradictions and conflicts they encounter as a result of many factors (Loh et al., 2006). Compared with traditional methods, TRIZ theory not only considers one problem, but all the related issues as well. Then, by analyzing the problems, TRIZ theory further tries to develop standard solutions to effectively solve the problems.

After analyzing the contradictions among the factors, Altshuller developed 39 improved parameters and worsening parameters from 40,000 solutions. Then, based on the contradictions, he constructed a 39x39 "TRIZ contradiction matrix." In the contradiction matrix, the numbers in each box can correspond to 40 Inventive Principles, which can provide careful reference for practitioners. Initially, 39 parameters (e.g., length, weight, power, and reliability) are provided for engineering solutions. Mann (2000; 2007) formulated a business version of the matrix, with 31 parameters, which are directly relevant to business issues, including R&D Spec/Capability/Means, Production Spec/Capability/Means, Product Reliability, Supply Spec/Capability Means, and Customer Revenue/Demand/Feedback, among others.

We aim to apply TRIZ theory in the e-commerce field to identify the core problems in e-shopping websites' business operations and the corresponding inventive principles that can solve these problems.



### 3. Questionnaire design

In this section, we discuss the design of the questionnaire and the application of FAHP and interpretive modeling to develop the questionnaire items, which were based on the factors from Table 1.

#### 3.1 FAHP

The questionnaire was designed according to FAHP and included five parts: virtual information space, virtual communication space, virtual distribution space, virtual transaction space, and personal data. In Table 1, we have shown that the factors for an e-shopping website business are identified in the third level. Then, the factors from the third level with similar characteristics were grouped in the second level. Finally, the factors that belong to the same virtual space were grouped in the first level.

All factors discussed in this study are classified into four virtual spaces (shown in Table 1). For each virtual space, the questionnaire further separated them into three parts: Part 1—measuring the effect of the factors in the second level on managers; Part 2—designing the questionnaire based on the hypotheses of partial and complete inheritance laws; and Part 3—designing the questionnaire based on the hypothesis of the complete independent law. For the measurement of the questionnaire's results, the scale set up in this study depends on the items' effectiveness. Effective items have high scores, and ineffective items get the lowest score of 1.

#### 3.2 Interpretive structural model

The interpretive structural method is an analysis method first used to determine the factors or elements of a given subject first and then to identify the elements for a website's business operations depending on the classification introduced in Section 2.2. Our study uses the model to measure the relationship between every two factors by designing the questionnaire, in which respondents are asked things such as, "Do you think that the parameter A will affect the parameter B directly?" If responders agree with a particular statement, they select "Yes"; otherwise they choose "No."

In this study, we use interpretive structural modeling to discuss the relationship of each pair of factors and apply the results to define and prioritize the elements of business operations for e-shopping websites.



## 4. Data analysis

In this section, we discuss in detail the results of our questionnaire in three parts: the fuzzy analytic hierarchy process, interpretive structural analysis, and the elements of a website's business operations in priority.

### 4.1 FAHP

#### 4.1.1 Samples and descriptive statistics

FAHP was chosen for the present research, as it is applicable with as few as four samples, which makes it a quite universal method (Hu, 2006; Bozbura and Beskese, 2007; Durán and Aguilo, 2008). In this study, we focus on the famous e-shopping websites to perform the analysis. The sample website list comes from the manager of the Taiwan top-three online sales website, PChome. The criteria we used to select sample websites are: (1) 99.9% of online customers evaluate the performance of the website as good; (2) at least 100,000 online visitors and at least 10,000 online purchases are made within one year; (3) the website reviews of PChome are ranked as excellent; (4) the website owner is willing to fill out the questionnaire. The questionnaire was distributed by email, and we received 16 effective responses from April 1st to April 21st, 2009. However, due to incomplete answers, four of the 16 were removed from the sample. Table 3 presents the basic descriptive data.

#### 4.1.2 Results

FAHP includes five stages (Bozbura and Beskese, 2007; Durán and Aguilo, 2008). The first stage involves establishing a hierarchical structure, and the second stage involves establishing a pair-compare matrix. In the second stage, we have applied the concepts of FAHP (Sheu, 2004) to establish the pairwise comparison matrix by order scale. Because of that, this study uses three methods to calculate the weights of the hierarchy. In the third stage, the eigenvector and eigenvalue are evaluated. The fourth stage involves testing the homogeneity of the matrix. Finally, the last stage involves calculating the weights of the whole hierarchy.

The results show that for the ICDT model, the C.I. and C.R. values in both the second and third hierarchies meet the standards. Referring these results to the matrix for all four spaces, they all are homogeneous. The three hypotheses and the weight ranks are shown in Table 4.



▼ Table 3 Population statistics of the research sample

Population Demographics		No. of people	%
Gender	Male	9	56.2
	Female	7	43.8
Education	Junior high school	-	-
	Senior high school or vocational school	1	6.3
	Junior college	6	37.5
	University	9	56.2
	Graduate school and above	-	-
Age	21 to 29	3	18.75
	30 to 34	7	43.75
	35 to 39	3	18.75
	40 to 44	3	18.75
Time involved in business operations	1~3 years	8	50
	3~5 years	6	37.5
	Over 5 years	2	12.5

Resource: This study

▼ Table 4 Weight evaluation for the three hypotheses

Factor number <sup>1</sup>	Rank <sup>2</sup>	Partial inheritance law	Complete inheritance law	Complete independent law
XI1		14	15	10
XI2		16	16	13
XI3		3	12	14
XI4		11	14	9
XI5		8	13	4
XI6		13	7	1
XI7		6	5	15
XI8		10	6	16
XI9		15	11	8
XI10		9	9	6
XI11		4	8	2
XI12		12	10	11
XI13		2	2	12
XI14		1	1	5
XI15		7	4	7
XI16		5	3	3

Note: <sup>1</sup> Look at Table 1; <sup>2</sup> The ranks are ordered from more to less important.



The weight evaluation refers to the characteristics of the partial inheritance law, so that if the number of factors in each level is the same, the weight of the factors will be equal. Our study avoids using this method to prevent hierarchies with more factors from receiving less weight. However, in the cases of the complete inheritance law and the complete independent law, the weight values will be divided into large proportions to the important factors in the front side of the rank and then in smaller proportions to the other ones. In this study, we use these two methods simultaneously to rank factors in order to determine the most adoptable results. Finally, this study adopts four factors—two factors from the complete inheritance law: XI and XI2, and two from the complete independent law: XI7 and XI8. Since it is better for managers to understand their products' classifications and positions before distributing product information throughout their websites, this study finally adopts the complete inheritance law to define the key factors for e-shopping websites.

Based on Daniel's (1961) principle that suggests choosing three to six key factors starting from the highest ranks for each of the four spaces:

- (1) Virtual information space: XI8, XI7, XI3, XI2, XI12, XI13
- (2) Virtual communication space: XC9, XC15, XC11, XC1, XC8, XC4.
- (3) Virtual distribution space: XD5, XD1, XD2.
- (4) Virtual transaction space: XT1, XT2, XT3.

## 4.2 ISM analysis

The main idea of ISM is to analyze the causal relationships between factors. Since the method of analysis used for ISM is different from that of FAHP, the subjects who use questionnaire also differ for these two methods. In order to collect information from both fields of industry and science and determine more actual and representative relations, this study sets up three kinds of subjects for our questionnaire: (1) managers with over five years of successful experience recommended by the manager of PChome; (2) E-commerce scholars or information management instructors; (3) local institutions (information industry) with experience in assisting with business operations for e-shopping websites. In total, we received 12 completed questionnaires, and 11 of them are effective questionnaires.

In the ISM analysis, there are seven processes, and this study uses four of them, as discussed below (Ravi et al., 2005; Chang, 2007; Gonzalez-Perez and Henderson-Sellers, 2007; Wang et al., 2008):



- (1) Virtual information space: The factors in the first level are XI7, XI8, XI3 (see Figure 1).

This study suggests that managers establish their websites' position and try to understand what kinds of products (e.g., tangible products, information providing services), customized services, or information (e.g., what concerns users, the core values of the websites) they should systematically provide for their customers. Therefore, these three factors need to be considered as priorities when operating a web-based business.

- (2) Virtual communication space: The factors in the first level are XC9 and XC15.

Our study suggests that managers should cultivate good and prompt interactive relationships with customers to influence their behaviors. It is especially advised to interact with customers who have more long-term experience in using computers.

- (3) Virtual distribution space: The factor in the first level is XD1.

We suggest that if managers can shorten the amount of time that their customers wait for products, customers should be more willing to recommend their websites to others and also to purchase more products themselves. Therefore, management should prioritize the issue of shortening customers' waiting time.

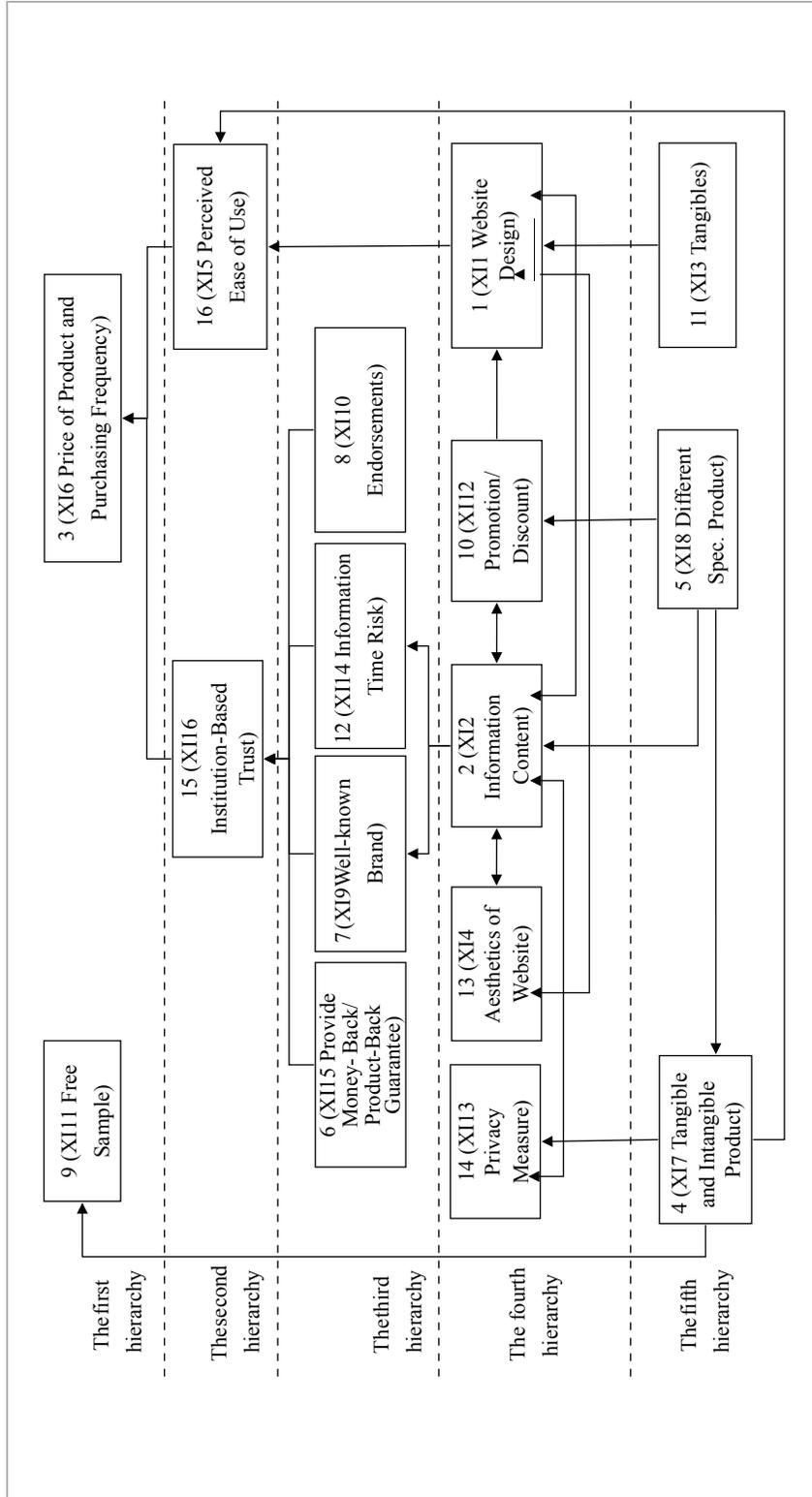
- (4) Virtual transaction space: The factors in the first level are XT1, XT2, and XT3.

This study suggests that managers should make their websites more useful by enhancing safety/privacy, familiarity and the reliability of transactions. Customers should feel that making a purchase on a website is safe.

### 4.3 Important factors for e-shopping websites' virtual spaces

This study selects out the important factors from the analysis results on the basis of chosen selection criteria, which include the following: 1. factors shown both in the results of the FAHP and ISM analyses; 2. factors with the highest weights in the FAHP analysis. The first criterion helps us decide which factor to choose if two analysis models determine the importance of the factor, based on the factor having, or not having, critical influence on the virtual space business. According to the second criterion, in order to define which one of the factors should be considered first, this study will select factors depending on their order of importance (see Figure 1).

The results, therefore, are XI3 for virtual information space, XC9 for virtual communication space, XD1 for virtual distribution space, and XT1 for virtual transaction space.



▲ Figure 2 The relationships between each level of virtual information space



We advise managers to plan the direction of their website business operations based on these factors. This study further transfers the prioritized factors into core problems and applies TRIZ theory to formulate improvement strategies.

## 5. Application of TRIZ theory in strategy development

In the virtual information space, the important factor “X13 Tangibles” stands for the content of the products and services provided by a website. Therefore, this study transfers factor “X13” into the core problem P11, that confusing information on the website will make it more difficult for customers to find the information. Through the application of the TRIZ contradiction matrix, used to determine the better, worse, and innovative principles, the strategy for solving the core problem P11 formulated by this study is as follows:

(1) Formulate a strategy.

If managers do not design their websites in an organized way, it will make it more difficult for customers to find the information they need. This idea is similar to the decoration and design of tangible stores: if managers of a physical store do not classify and organize their products well, their customers will have a difficult time finding the products. As such, customers will be not willing to make purchases in their stores.

(2) Select better and worse parameters.

(a) Better parameter “13 Stability of the object’s composition”: This means that website managers should design the spaces or pages for each type of information in advance, and then put relative information to the right space or page in order to present information on the website in the most efficient way.

(b) Worse parameter “12 Shape”: This parameter means that since customers can have different levels of understanding of information on a website, some of them may not know how to utilize the information based on a website’s design.

(3) Match the TRIZ contradiction matrix with the inventive principles.

The inventive principles are “Principle 1: Segmentation,” “Principle 4: Asymmetry,” “Principle 18: Mechanical Vibration,” and “Principle 22: Blessing in Disguise.”

(4) Select the inventive principles and develop a strategy.

(a) Inventive Principle 1: Segmentation: Principle 1 involves separating objects



into several independent parts, which means that websites should organize their information first based on the content of information and the frequency and regularity of changes and updates.

- (b) Strategy SI1: Managers can arrange different spaces to periodically update information depending on the frequency and regularity of changing or updating the information, so that it will guide the customers and help them to get used to the website.

As for the three other virtual spaces, the application of the TRIZ theory and the strategies used to address the core problems are as follows:

- (1) Virtual communication space.

Core problem PC1: Customers will be not satisfied with a website if responses from the website staff are not sufficiently professional or clear to address customers' questions and help them with their problems.

Strategy SC1: Managers can set up the documentation for standard responding principles and describe the response procedure with the use of pictures or illustrations. As a result of improved responses, customers should have a better understanding of and satisfaction with the services offered by a particular website.

- (2) Virtual distribution space.

Core problem PD1: Customers complain and become upset when there are delays in the delivery of products and services offered by a website.

Strategy SD1: Managers can simultaneously use e-mails and messages to inform their customers about the current delivery situation and provide them with substitutive plans.

- (3) Virtual transaction space.

Core problem PT1: Customers doubt a website's safety when its managers do not show or update the safety protection licenses, such as SSL and SET.

Strategy ST1: Managers can establish a transaction web management system to supervise and manage customers' personal data to ensure the safety of transactions.

## 6. Conclusions

In contrast to prior studies that have examined the perspective of consumers, our



research from the perspective of business managers offers companies a set of rules for running e-shopping websites. As such, companies can have a more complete and practical strategy. In terms of the practical implications of the results, we identified the core problems for four virtual spaces and provided correspondent strategies to address these problems; this can be quite helpful not only for people who want to run e-shopping websites, but also for those who already run e-shopping websites by improving their virtual spaces. In terms of the theoretical implications, we adopted ICDT as our construct, and used FAHP, ISM and TRIZ to provide different theoretical perspectives regarding strategies.

Our research has several limitations. Since we only have 16 effective samples recommend by PChome, the sample size is quite small. In addition, many different e-shopping websites were not considered in this research. Therefore, we also have several suggestions for future studies. First, future research can include different e-shopping websites in different products or industries to explore potential differences between industries. Second, future research could also attempt to find successful strategies for B2B e-shopping websites.

## References

- Agarwal, A., Shankar, R., & Tiwari, M. K. (2007). Modeling agility of supply chain. *Industrial Marketing Management*, 36(4), 443-457.
- Akaah, I. P., & Korgaonkar, P. K. (1988). A conjoint investigation of the relative importance of risk relievers in direct marketing. *Journal of Advertising Research*, 28(4), 38-44.
- Angehrn, A. (1997). Designing mature Internet business strategies: The ICDT model. *European Management Journal*, 5(4), 361-369.
- Belton, V., & Gear, T. (1985). The legitimacy of rank reversal – A comment. *Omega*, 13(3), 143-144.
- Blake, B. F., Neuendorf, K. A., & Valdiserri, C. M. (2003). Innovativeness and variety of internet shopping. *Internet Research: Electronic Networking Applications and Policy*, 13(3), 156-169.
- Bozbura, T. F., & Beskese, A. (2007). Prioritization of organizational capital measurement indicators using fuzzy AHP. *International Journal of Approximate Reasoning*, 44(2),



124-147.

- Butler, P., & Peppard, J. (1998). Consumer purchasing on the Internet: Process and prospects. *European Management Journal*, 16(5), 600-610.
- Chang, M. K., Cheung, W. M., & Lai, V. S. (2005). Literature derived reference models for the adoption of online shopping. *Information & Management*, 4(42), 543-559.
- Chang, N. (2007). From complexity to structure: Applications of interpretive structural modeling. *Journal of Public Affairs Review*, 8(1), 1-29.
- Chang, N., Wang, M. S., Chen, Y. M. (2008). Using ISM to explore the strategies for possible impacts on Kaohsiung's grand development from cross-strait direct shipping. *Journal of Management*, 25(6), 135-154.
- Chen, W. L., & Chen, M. J. (2010). A content analysis study for shopping website: From internet interactive view. *Electronic Commerce Studies*, 8(1), 123-151.
- Chen, Y. F. (2010). Analysis of feasibility of the college students starting an enterprise online. *Journal of Inner Mongolia Radio & TV University*, 122, 96-97.
- Childers, L., Carr, C. L., Peck, J., & Carson, S. (2001). Hedonic and utilitarian motivations for online retail shopping behavior. *Journal of Retailing*, 77(4), 511-535.
- Chu, K. T., Wang, S. M., Hou, J. L., Tang, J. H., & Sheu, J. J. (2012). Customer behavior analysis by using multiple databases: A case of university students' use of online bookstore services. *Journal of Internet Technology*, 13(6), 891-907.
- Cronin, J., Brady, M. K., & Hult, T. M. (2000). Assessing the effects of quality, value, and customer satisfaction on consumer behavioral intentions in service environments. *Journal of Retailing*, 76(2), 193-218.
- Daniel, R. D. (1961). Management information crisis. *Harvard Business Review*, 35(5), 111-121.
- Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3), 319-340.
- Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1992). Extrinsic and intrinsic motivation to use computers in the workplace. *Journal of Applied Social Psychology*, 22(14), 1111-1132.
- DeLone, W. H., & McLean, E. R. (2003). The DeLone and McLean model of information systems success: A ten-year update. *Journal of Management Information Systems*, 19(4), 9-30.
- Deng, Z. Y., & Zeng, K. H. (1989). Analytical hierarchy process (AHP) of content characteristic and application (Part 1). *Chinese Statistical Report*, 27(6), 6-22.



- Ding, X. Q. (2007). Antecedents of perceived risk and the methods of reducing risk in internet shopping: The views of consumers. *Operating Management Reviews*, 3(2), 97-116.
- Durán, O., & Aguilo, J. (2008). Computer-aided machine-tool selection based on a fuzzy-AHP approach. *Expert Systems with Applications*, 34(3), 1787-1794.
- Fan, W. S., & Chang, R. S. (2007). A study for construct of e-commerce website business environment and effect measures model. *Management Review*, 26(2), 39-67.
- Gefen, D. (2000). E-Commerce: The role of familiarity and trust. *Omega*, 28(6), 725-737.
- Gefen, D., Karahanna, E., & Straub, D. W. (2003). Trust and TAM in online shopping: An integrated model. *MIS Quarterly*, 27(1), 51-90.
- Gonzalez-Perez, C., & Henderson-Sellers, B. (2007). Modeling software development methodologies: A conceptual foundation. *Journal of Systems and Software*, 80(11), 1778-1796.
- Ha, S., & Stoel, L. (2008). Consumer e-shopping acceptance: Antecedents in a technology acceptance model. *Journal of Business Research*, 62(5), 565-571.
- Hausman, A. V., & Siekpe, J. S. (2009). The effect of web interface features on consumer online purchase intentions. *Journal of Business Research*, 62(1), 5-13.
- He, D., Lu, Y., & Zhou, D. (2008). Empirical study of consumers' purchase intentions in C2C electronic commerce. *Tsinghua Science & Technology*, 13(3), 287-292.
- Hu, C. Y. (2006). *To determine the key factors that influence consumers to join the group purchasing online*. Unpublished master dissertation, National Chung Hsing University, Taiwan.
- Kwak, H., Fox, R. J., & Zinkhan, G. M. (2002). What products can be successfully promoted and sold via the Internet? *Journal of Advertising Research*, 42(1), 23-38.
- Liang, T. P., & Lai, H. J. (2002). Effect of store design on consumer purchases: Van empirical study of online bookstores. *Information & Management*, 39(6), 431-444.
- Liang, Y. H., & Lee, T. M. (2006). Constructing measurement model for on-line auction service quality. *Electronic Commerce Studies*, 4(4), 451-473.
- Liao, C., & Chiang, C. C. (2005). An empirical investigation of the relationships among web service quality, customer satisfaction, and behavior intention: A study of online shopping behaviors. *Journal of Management & Systems*, 12(1), 23-47.
- Liao, P. C. (2012). *The design and implementation of an EC search engine*. Unpublished master thesis, National Chung Cheng University, Taiwan.
- Liao, Z., & Cheung, M. T. (2001). Internet-based e-shopping and consumer attitudes: An



- empirical study. *Information & Management*, 38(5), 299-306.
- Liaw, G. F., Zhu, Z. W., & Lee, Y. H. (2005). The effects of risk reduction strategies on consumers' risk perceptions and online purchase intention. *Pan-Pacific Management Review*, 8(1), 1-37.
- Lim, N. (2003). Consumers' perceived risk: Sources versus consequences. *Electronic Commerce Research and Applications*, 2(3), 216-228.
- Lin, Y. H. (2005). The fuzzy approach of interpretive structural modeling and its applications in concept structure. *Journal of Education & Psychology*, 28(1), 161-183.
- Lin, K. J., Yu, T., & Zhang Y. (2007). Efficient algorithms for web services selection with end-to-end QoS constraints. *ACM Transactions on the Web*, 1(1), 1-26.
- Loh, H. T., Cong, H., & Shen, L. X. (2006). Automatic classification of patent documents for TRIZ users. *World Patent Information*, 28(1), 6-13.
- Mann, D. (2007). *Hands-on Systematic Innovation for Business and Management*. UK: Lazarus Press.
- McKnight, D. H., Choudhury, V., & Kacmar, C. (2000). Trust in E-Commerce vendors: A two-stage model. *The 21th International Conference on Information Systems*, Brisbane, Australia.
- Palmer, J. W. (2002). Website usability, design, and performance metrics. *Information Systems Research*, 13(2), 151-167.
- Parasuraman, A., Valarie, A. Z., & Leonard, L. B. (1994). Reassessment of expectations as a comparison standard in measuring service quality: Implications for further research. *Journal of Marketing*, 58(1), 111-124.
- Parasuraman, A., Zeithaml, V. A., & Malhotra, A. (2005). E-S-QUAL: A multiple scale for assessing electronic service quality. *Journal of Service Research*, 7(3), 213-233.
- Phau, I., & Poon, S. M. (2000). Factors influencing the types of products and services purchased over the internet. *Internet Research: Electronic Networking Applications and Policy*, 10(2), 102-113.
- Poel, D. V. D., & Leun, J. (1999). Consumer acceptance of the internet as a channel of distribution. *Journal of Business Research*, 45(3), 249-256.
- Ranganathan, C., & Ganapathy, S. (2002). Key dimensions of business-to-consumer websites. *Information & Management*, 39(6), 457-465.
- Rantanen, K., & Domb, E. (2002). *Simplified TRIZ: New problem-solving applications for engineers and manufacturing professionals*. FL: Auerbach Publications.
- Ravi, V., Shankar, R., & Tiwari, M. (2005). Analyzing alternatives in reverse logistics



- for end-of-life computers: ANP and balanced scorecard approach. *Computers & Industrial Engineering*, 48(2), 327-356.
- Robinson, L., Jr., Marshall, G. W., & Stamps, M. B. (2004). Sales force use of technology: Antecedents to technology acceptance. *Journal of Business Research*, 58(12), 1623-1631.
- Roselius, T. (1971). Consumer rankings of risk reduction methods. *Journal of Marketing*, 35(1), 56-61.
- Saaty, T. L. (1980). *The analytic hierarchy process*. New York: McGraw-Hill.
- Santos, J. (2003). E-service quality: A model of virtual service quality dimensions. *Managing Service Quality*, 13(3), 233-246.
- Sheu, J. B. (2004). A hybrid fuzzy-based approach for identifying global logistics strategies. *Transportation Research Part E*, 40(1), 39-61.
- Shiri, D. V., Banwet, D. K., & Shankar, R. (2008). Analysis of interactions among core, transaction and relationship-specific investments: The case of offshoring. *Journal of Operations Management*, 26(2), 180-197.
- Tan, S. J. (1999). Strategies for reducing consumers' risk aversion in Internet shopping. *Journal of Consumer Marketing*, 16(2), 163-180.
- van Laarhoven, P. J. M., & Pedrycz, W. (1983). A fuzzy extension of Saaty's priority theory. *Fuzzy Sets and Systems*, 11(1-3), 229-241.
- Vijayasathay, L. R. (2002). Product characteristics and internet shopping intentions. *International Research: Electronic Networking Applications and Policy*, 12(5), 411-426.
- Vijayasathay, L. R., & Jones, J. M. (2000). Print and internet catalog shopping: Assessing attitudes and intentions. *Internet Research: Electronic Networking Applications and Policy*, 10(3), 191-202.
- Wang, C. C. (2007). Constructing a supporting model of customer requirement management using interpretive structural modeling. *Kaohsiung Normal University Journal*, 22(3), 103-116.
- Wang, G., Wang, Y., & Zhao, T. (2008). Analysis of interactions among the barriers to energy saving in China. *Energy Policy*, 36(6), 1879-1889.
- Wang, K. L. (2011). *Applying search engine marketing to e-commerce website architecture*. Unpublished master dissertation, National Taipei University of Technology, Taiwan.
- Wang, M. Y., Kuo, H. M., & Hwang, S. L. (2005). A study of B2C consumer behavior model. *Journal of the Chinese Institute of Industrial Engineers*, 22(5), 379-392.



- Wang, S., Tian, J., Wang, M. T., Hwang, J. W. (2011). Risk perception and e-purchase intention: Implications for online CRM. *Journal of e-Business*, 13(2), 281-301.
- Wang, X. W., & Ho, Q. L. (2006). Key dimensions of consumer behavior on B2C web sites. *Operation Management Reviews*, 2(1), 1-28.
- Warfield, J. (1976). *Societal Systems: Planning Policy and Complexity*. New York: John Wiley & Sons, Inc.
- Westbrook, R. A. (1980). A rating scale for measuring product/ service satisfaction. *Journal of Marketing*, 44(4), 68-72.
- Wu, J., & Shih, C. (2012). The developing trends of e-commerce and researches of problem. *Journal of Shandong Academy of Governance*, 120, 9-91.
- Wu, K. W., Huang, S. Y., Yen, D. C., & Popova, I. (2012). The effect of online privacy policy on consumer privacy concern and trust. *Computers in Human Behavior*, 28(3), 889-897.
- Wu, Y. H., Chu, S. Y., & Fang, W. C. (2008). An empirical study of trust and TAM-An example of online shopping. *Journal of Information Management*, 15(1), 123-152.
- Yang, Z., & Jun, M. (2002). Consumer perception of E-service quality: From internet purchaser and non-purchaser perspectives. *Journal of Business Strategies*, 1(19), 19-41.
- Yu, C. C. (2012). Discussion of Internet privacy protection. *Journal of Chifeng University*, 33(9), 33-35.